

IN THE CLAIMS

1. (previously presented) A picture information conversion apparatus for down-converting interlaced scanning formatted input compressed picture information encoded according to the MPEG2 (motion picture experts group) standard to progressive scanning formatted output compressed picture information encoded according to the MPEG4 standard, said apparatus comprising:

picture type decision means for determining picture types in the input compressed picture information that includes intra-frame coded (I) pictures, forward inter-frame predictive-coded (P) pictures, and bi-directional inter-frame predictive-coded (B) pictures; and discarding B-pictures from the input compressed picture information;

decoding means for decoding the I-pictures and P-pictures of the input compressed picture information output from the picture type decision means by processing the interlaced scanning formatted pictures on a macroblock basis using four of eight low-range discrete cosine transform (DCT) coefficients in each of the horizontal and vertical directions of the macroblock;

scanning conversion means for discarding a field from the interlaced scanning formatted decoded pictures to generate progressive scanning formatted pictures; wherein said scanning conversion means selects one of the first and second fields of an interlaced picture decoded by said decoding means to convert an interlaced picture having 1/2 resolution for both the horizontal and vertical directions with respect to said input compressed picture information to a progressively-scanned picture having a resolution of 1/2 in the horizontal direction

and a resolution of $1/4$ in the vertical direction with respect to said input compressed picture information;

decimating means for decimating by performing $1/2$ down-sampling in the horizontal direction the progressive scanning formatted pictures generated by said scanning conversion means; and

encoding means for encoding the decimated pictures according to the MPEG4 standard to generate the output compressed picture information having a resolution of $1/4 \times 1/4$ of the input compressed picture information.

2-4. (canceled)

5. (previously presented) The picture information conversion apparatus according to claim 1 wherein said decoding means decodes only I-pictures and P-pictures.

6. (previously presented) The picture information conversion apparatus according to claim 1 wherein said input compressed picture information has been variable-length coded;

said decoding means including variable length decoding means for variable-length decoding the compressed picture information and IDCT means for inverse discrete cosine transforming the compressed picture information variable-length decoded by said variable length decoding means, said variable length decoding means variable-length decoding only DCT coefficients necessary for IDCT in said IDCT means depending on whether a macroblock forming said input compressed picture information is in a field mode or a frame mode.

7. (original) The picture information conversion apparatus according to claim 6 wherein said IDCT means is associated with the field mode and applies IDCT to DCT coefficients of four horizontal and vertical low-range coefficients of eight horizontal and vertical DCT coefficients making up said macroblock.

8. (previously presented) The picture information conversion apparatus according to claim 6 wherein said IDCT means executes processing operations using a pre-set fast algorithm.

9. (original) The picture information conversion apparatus according to claim 6 wherein said IDCT means is associated with the frame mode and applies IDCT to DCT coefficients of four horizontal low-range coefficients of the eight horizontal and vertical DCT coefficients making up said macroblock, said IDCT means applying field separation IDCT to DCT coefficients of four vertical low-range coefficients of the eight horizontal and vertical DCT coefficients.

10. (previously presented) The picture information conversion apparatus according to claim 9 wherein said IDCT means executes processing operations using a pre-set fast algorithm.

11. (original) The picture information conversion apparatus according to claim 9 wherein said IDCT means executes IDCT on four horizontal and vertical DCT coefficients of four horizontal and eight vertical DCT coefficients and also using four horizontal low-range coefficients and two vertical DCT

coefficients consecutive vertically to said four low-range horizontal and vertical low-range coefficients, with the remaining coefficients being set to 0.

12. (previously presented) The picture information conversion apparatus according to claim 1 wherein said input compressed picture information has been motion-compensated using a motion vector, said decoding means including motion compensation means for motion-compensating a picture using the motion vector, said motion compensation means executing interpolation to 1/4 pixel precision for both the horizontal and vertical directions based on the motion vector of said input compressed picture information.

13. (original) The picture information conversion apparatus according to claim 12 wherein said motion compensation means executes interpolation in the horizontal direction to 1/2 pixel precision, using a double-interpolation digital filter, said motion compensation means executing interpolation to 1/4 pixel precision by linear interpolation.

14. (previously presented) The picture information conversion apparatus according to claim 12 wherein said motion compensation means executes interpolation in the horizontal direction on said macroblock in the frame mode to 1/2 pixel precision, using a double interpolation digital filter, said motion compensation means also executing intra-field interpolation to 1/4 pixel precision by linear interpolation.

15. (previously presented) The picture information conversion apparatus according to claim 12 wherein said motion

compensation means executes interpolation in the vertical direction on said macroblock in the frame mode to 1/2 pixel precision, using a double interpolation digital filter, said motion compensation means also executing intra-field interpolation to 1/4 pixel precision by linear interpolation.

16. (original) The picture information conversion apparatus according to claim 12 wherein said digital filter is a half-band filter.

17. (original) The picture information conversion apparatus according to claim 16 wherein said digital filter previously calculates coefficients equivalent to a series of interpolation operations to apply said coefficients directly to pixel values depending on values of the motion vector of a macroblock of said input compressed picture information.

18. (original) The picture information conversion apparatus according to claim 12 wherein said motion compensation means virtually creates, for pixels lying outside a picture frame of a picture forming said input compressed picture information required for effecting double interpolation filtering, pixels as necessary outside said picture frame of said picture, by way of a filtering processing operation.

19. (original) The picture information conversion apparatus according to claim 18 wherein said motion compensation means mirrors preexisting pixels at a pre-set location of an array of said pixels, elongates said array of the pre-existing pixels or uses pre-set values to create necessary pixels outside said picture frame.

20. (canceled)

21. (previously presented) The picture information conversion apparatus according to claim 1 wherein said scanning conversion means adjusts the number of pixels in the vertical direction so as to cope with macroblock-accommodating processing in said encoding means.

22. (previously presented) The picture information conversion apparatus according to claim 1 wherein said decimating means decimates a progressively-scanned picture of the input compressed picture information from said scanning conversion means, having a resolution of $1/2$ in the horizontal direction and a resolution of $1/4$ in the vertical direction, to output a progressively-scanned picture having a resolution of $1/4$ for both the horizontal and vertical directions of said input compressed picture information.

23. (original) The picture information conversion apparatus according to claim 22 wherein said decimating means performs down-sampling using a low-pass filter having several taps.

24. (original) The picture information conversion apparatus according to claim 22 wherein said decimating means adjusts the number of pixels in the horizontal direction so as to enable said encoding means to perform macroblock-based processing.

25. (canceled)

26. (original) The picture information conversion apparatus according to claim 1 wherein said compressed picture information has been motion-compensated by a motion vector, wherein there is provided motion vector synthesis means for synthesizing the motion-compensating vector, the motion vector associated with a picture output from said decimating means being synthesized based on the motion vector of said input compressed picture information, said encoding means performing the encoding based on said motion vector.

27. (original) The picture information conversion apparatus according to claim 26 wherein there is provided motion vector detection means for detecting the motion vector based on a motion vector synthesized by said motion vector synthesizing means.

28. (previously presented) A picture information conversion method for down-converting interlaced scanning formatted input compressed picture information encoded according to the MPEG2 (motion picture experts group) standard to progressive scanning formatted output compressed picture information encoded according to the MPEG4 standard, said method comprising:

a picture type decision step of determining picture types in the input compressed picture information that includes intra-frame coded (I) pictures, forward inter-frame predictive-coded (P) pictures, and bi-directional inter-frame predictive-coded (B) pictures; and discarding B-pictures from the input compressed picture information;

a decoding step for decoding the I-pictures and P-pictures of the input compressed picture information output from the picture type decision means by processing the interlaced scanning formatted pictures on a macroblock basis using four of eight low-range discrete cosine transform (DCT) coefficients in each of the horizontal and vertical directions of the macroblock;

a scanning conversion step for discarding a field from the interlaced scanning formatted decoded pictures to generate progressive scanning formatted pictures; wherein said scanning conversion step selects one of the first and second fields of an interlaced picture decoded in said decoding step to convert an interlaced picture having $1/2$ resolution for both the horizontal and vertical directions with respect to said input compressed picture information to a progressively-scanned picture having a resolution of $1/2$ in the horizontal direction and a resolution of $1/4$ in the vertical direction with respect to said input compressed picture information;

a decimating step for decimating by performing $1/2$ down-sampling in the horizontal direction the progressive scanning formatted pictures generated by said scanning conversion step; and

an encoding step for encoding the decimated pictures according to the MPEG4 standard to generate the output compressed picture information having a resolution of $1/4 \times 1/4$ of the input compressed picture information.

29-32. (canceled)